IN THE CLAIMS

This listing of the claim will replace all prior versions and listings of claim in the present application.

Listing of Claims

Claims 1-14 (canceled).

15. (new) A code-modulation adaptive and variable multiplexing transmission apparatus in which transmission is made such that transmission information data is divided into transmission signals on plural transmission sub-channels, said apparatus including a transmission unit comprising:

a transmission condition identifying circuit which identifies transmission condition information;

a transmission unit controlling circuit which controls said transmission unit based on transmission condition information identified by said transmission condition identifying circuit;

a data dividing circuit which divides said transmission information data into transmission signals each for one of said plural transmission sub-channels under the control of said transmission unit controlling circuit;

plural coders, one for each of said plural transmission sub-channels, each for performing an error-correction coding, in parallel, on respective one of said plural transmission signals divided by said data dividing circuit, by using a coding scheme and a coding ratio, plural primary modulators each for performing a multi-level modulation, in parallel, on respective one of said transmission signals on respective transmission sub-channels acquired from respective ones of said plural coders and plural secondary modulators each for performing, in parallel, a transmission-band broadening on a multi-level-modulated signal on a transmission sub-channel acquired from each of said plural primary modulators;

an addition circuit which adds, for each transmission sub-channel, to associated transmission signal, transmission condition information including a coding scheme and coding ratio of said each coder, a multi-level modulation scheme of said each primary modulator, a band-broadening scheme of said each secondary modulator and the number of said plural transmission sub-channels;

a frequency multiplexing circuit which frequency multiplexes band-broadened modulation outputs obtained from respective secondary modulators on said respective transmission sub-channels to output a resultant frequency multiplexed output as a channel for one and the same user.

16. (new) The code-modulation adaptive and variable multiplexing transmission apparatus according to claim 15, wherein each of said plural coders provided for respective ones of said plural transmission sub-channels is arranged to select an arbitrary one of a plurality of kinds of coding schemes (including convolutional coding, Reed-Solomon coding and BCH) and an arbitrary one of a plurality of kinds of coding ratios under the control of said transmission unit controlling circuit,

wherein each of said plural primary modulators provided for respective ones of said plural transmission sub-channels is arranged to select an arbitrary one of a plurality of kinds of multi-level modulation schemes (including QPSK including BPSK and 16QAM) under the control of said transmission unit controlling circuit, and wherein each of said plural secondary modulators provided for respective ones of said plural transmission sub-channels is arranged to select an arbitrary one of a plurality of kinds of band-broadening schemes (including OFDM and spread modulation) under the control of said transmission unit controlling circuit.

17. (new) A code-modulation adaptive and variable multiplexing transmission apparatus in which transmission is made such that transmission information data is divided into transmission signals for plural transmission sub-channels, said apparatus including a transmission unit, said transmission unit comprising:

a transmission condition identifying circuit which identifies transmission condition information;

a transmission unit controlling circuit which performs a control based on transmission condition information identified by said transmission condition identifying circuit;

a data dividing circuit which divides said transmission information data into transmission signals each for one of said plural transmission sub-channels under the control of said transmission unit controlling circuit;

plural coders, one for each of said plural transmission sub-channels and responsive to the control of said transmission unit controlling circuit, each for selecting an arbitrary one of a plurality of kinds of coding schemes (including convolutional coding, Reed-Solomon coding and BCH) and an arbitrary one of a plurality of kinds of coding ratios and for performing an error-correction coding, in parallel, on respective one of said plural transmission signals divided by said data dividing circuit;

plural primary modulators responsive to the control of said transmission unit controlling circuit, each for selecting an arbitrary one of a plurality of kinds of multi-level modulation schemes (including QPSK including BPSK and 16QAM) and for performing a modulation, in parallel, on respective one of said transmission signals on respective transmission sub-channels acquired from respective ones of said plural coders;

plural secondary modulators responsive to the control of said transmission unit controlling circuit, each for selecting an arbitrary one of a plurality of kinds of band-broadening schemes (including OFDM and spread modulation) and for performing a transmission-band broadening, in parallel, on a multi-level-modulated signal on a transmission sub-channel acquired from each of said plural primary modulators;

an addition circuit which adds, for each of said plural transmission sub-channels, to associated transmission signal, transmission condition information including a coding scheme and coding ratio of said each coder, a multi-level modulation scheme of said each primary modulator, a band-broadening scheme of said each secondary modulator and the number of said plural transmission sub-channels; and

a frequency multiplexing circuit which frequency multiplexes band-broadened modulation outputs obtained from respective secondary modulators on said respective transmission sub-channels to output a resultant frequency multiplexed output as a channel for one and the same user.

18. (new) The code-modulation adaptive and variable multiplexing transmission apparatus according to claim 15, further comprising a reception unit including:

a frequency separating circuit which frequency-separates a received frequency-multiplexed signal into a modulated signal for each of plural reception sub-channels;

a transmission condition identifying circuit which identifies transmission condition information in a signal on each reception sub-channel added on the transmission side, said transmission condition information including a modulation scheme and modulation ratio of each coder , a multi-level modulation scheme of each primary modulator, a band-broadening scheme of each secondary modulator and the number of said plural transmission sub-channels;

a reception unit controlling circuit which controls said reception unit based on the transmission condition information identified by said transmission condition identifying circuit;

plural secondary demodulators, one for each of plural reception sub-channels, and responsive to the control of said reception unit control circuit, each for demodulating, in parallel, a transmission band of each modulation signal on the plurality of reception sub-channels acquired by performing frequency separation from said frequency-separation circuit, by using a band-debroadening scheme corresponding to the band-broadening scheme identified by said transmission condition information identifying circuit;

plural primary demodulators responsive to the control of said reception unit controlling circuit, each for demodulating, in parallel, a modulated signal on each reception sub-channel demodulated by each of said plural secondary demodulators, by using a multi-level demodulation scheme corresponding to the multi-level modulation scheme identified by said transmission condition identifying circuit;

plural decoders responsive to the control of said reception unit controlling circuit, each for demodulating, in parallel, a reception signal on each reception sub-channel demodulated by each of said plurality of primary modulators, by using a demodulation scheme and coding ratio corresponding to the coding scheme and coding ratio identified by said transmission condition identifying circuit; and

a data combining circuit which combines reception information data acquired from respective decoders of said plural reception sub-channels under the control of said reception unit controlling circuit.

19. (new) A code-modulation adaptive and variable multiplexing transmission method in which transmission is made such that transmission information data is divided into transmission signals on plural transmission sub-channels, said method comprising the steps of:

identifying transmission condition information by using a transmission condition identifying circuit;

performing a control by using a transmission unit controlling circuit based on transmission condition information identified by said transmission condition identifying circuit;

dividing said transmission information data into transmission signals for said plural transmission sub-channels by using a data dividing circuit under the control of said transmission unit controlling circuit;

conducting the following sub-steps in each of said plural transmission sub-channels:

a sub-step of performing, by using each coder, an error-correction coding on a transmission signal on respective one of said plural transmission sub-channels divided by said step of dividing , by using a coding scheme and a coding ratio;

a sub-step of performing, by using each primary modulator, a multi-level modulation on a transmission signal of respective one of the transmission sub-channels acquired by said sub-step of performing error-correction coding;

a sub-step of performing, by using each secondary modulator, a transmission-band broadening on a multi-level-modulated signal on each transmission sub-channel acquired from said sub-step of performing multi-level modulation;

by using an addition circuit and for each of said plural transmission sub-channels, adding to associated transmission signal, transmission condition information including a coding scheme and coding ratio of said each coder, a multi-level modulation scheme of said each primary modulator, a band-broadening scheme of said each secondary modulator and the number of said plural transmission sub-channels; and

by using a frequency multiplexing circuit, frequency multiplexing band-broadened modulation outputs obtained from respective secondary modulators on said respective transmission sub-channels to output a resultant frequency multiplexed output as a channel for one and the same user.

20. (new) The code-modulation adaptive and variable multiplexing transmission method according to claim 19, further comprising the step of:

receiving a reception signal including the steps of:

by using a frequency separating circuit, frequency-separating a received frequency-multiplexed signal into a modulated signal for each of plural reception sub-channels;

at a transmission condition identifying circuit, identifying transmission condition information in a signal on each reception sub-channel added on the transmission side, said transmission condition information including a modulation scheme and modulation ratio of each coder , a multi-level modulation scheme of each primary modulator, a band-broadening scheme of each secondary modulator and the number of said plural transmission sub-channels;

performing a control at a reception unit controlling circuit based on the transmission condition information identified by said transmission condition identifying circuit;

performing the following sub-steps in each of said plurality of reception sub-channels:

a sub-step of, by using each secondary demodulator and in response to the control of said reception unit controlling circuit, demodulating a modulated signal on each reception sub-channel acquired by frequency-separating conducted at said step of frequency-separating, by using band-debroadening scheme corresponding to the band-broadening scheme identified by said step of transmission condition information identifying;

a sub-step of, in response to the control of said reception unit controlling circuit, demodulating a modulated signal secondary-demodulated on each reception sub-channel by using a multi-level demodulation scheme corresponding to the multi-level modulation scheme identified by said transmission condition identifying circuit;

a sub-step of, in response to the control of said reception unit controlling circuit and by using each demodulator, demodulating a reception signal on each reception sub-channel demodulated by said primary modulator, by using a demodulation scheme corresponding to the coding scheme and coding ratio identified by said transmission condition identifying circuit; and

by using a data combining circuit, combining reception information data acquired from respective decoders of said plural reception sub-channels under the control of said reception unit controlling circuit.